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Ecotoxicological evaluation of the effects caused by transformation- and byproducts from chemical treatment

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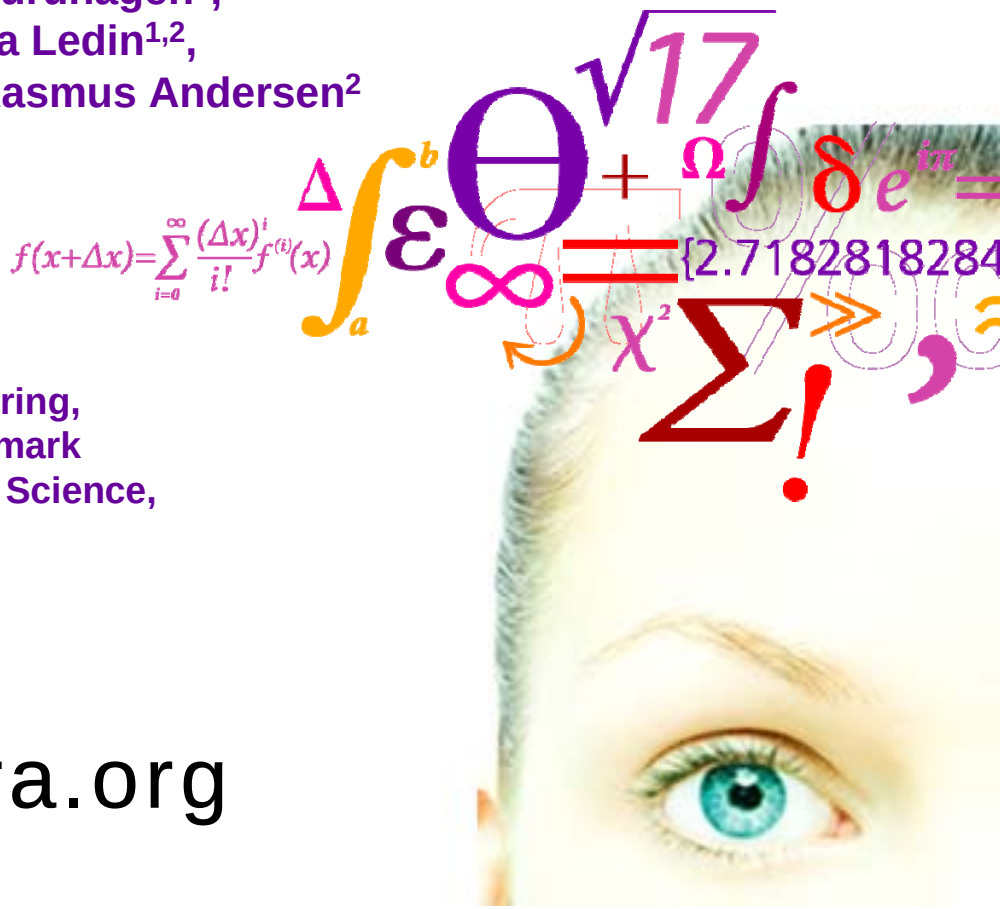

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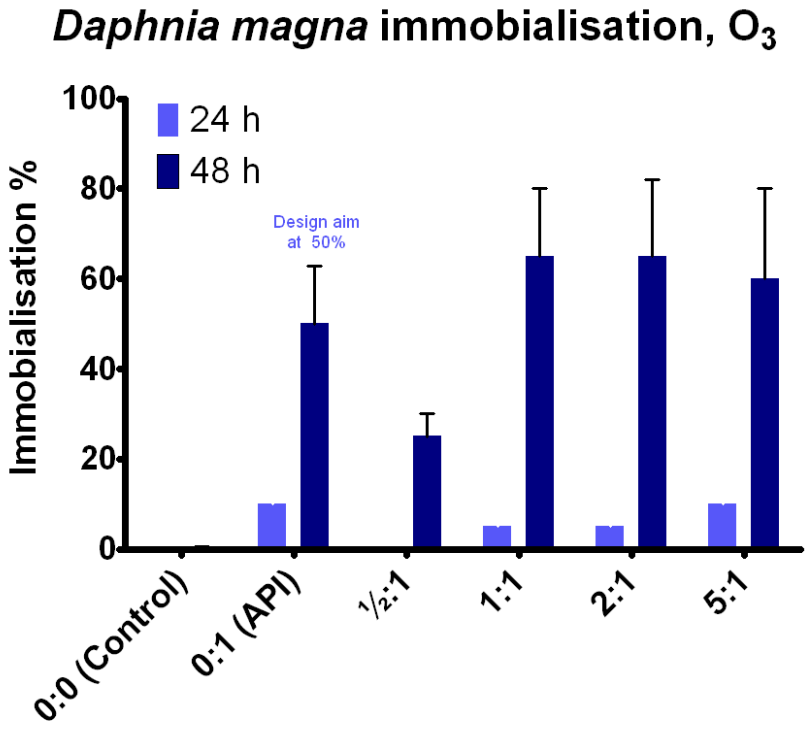
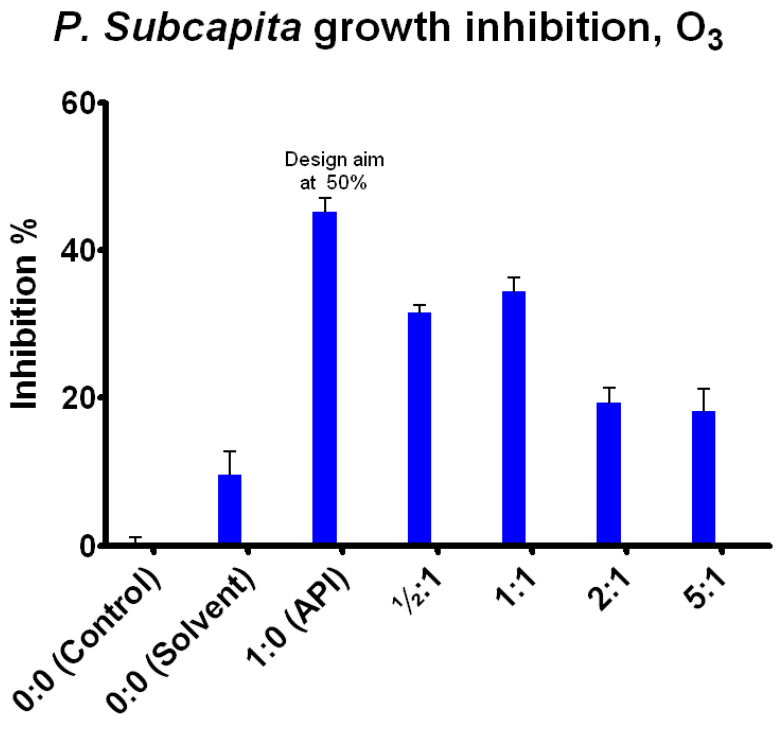
1.st objective of study

Does O_3 or ClO_2 treatment of pharmaceuticals create toxicity?

- **Treatment of mixture of 114 pharmaceuticals with molar ratios of oxidants from ½:1 to 5:1.**
- **Test at concentration equal to EC50 of the untreated mixture to detect increase or decrease in toxicity.**

Ia. Ozonation of pharmaceuticals

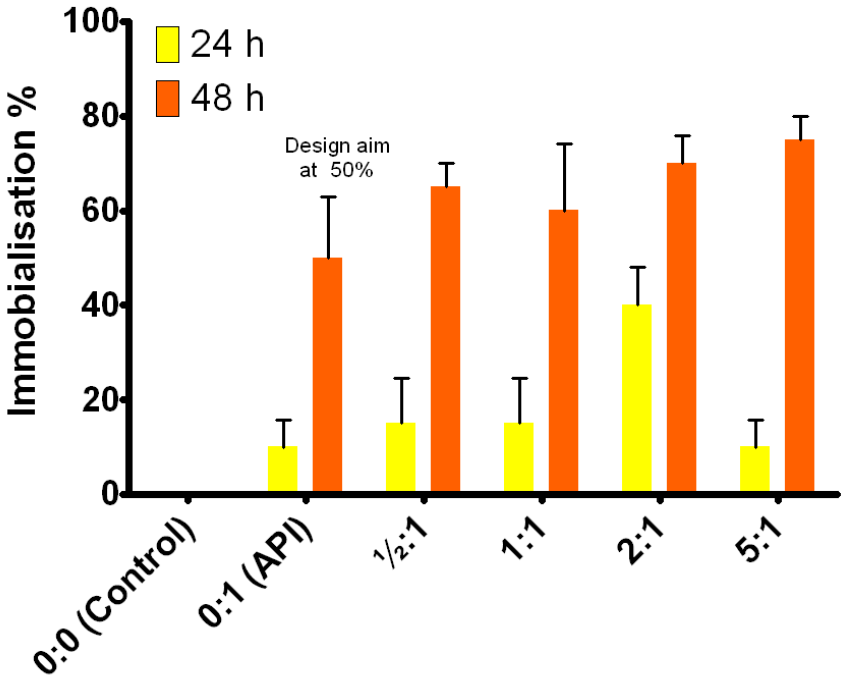




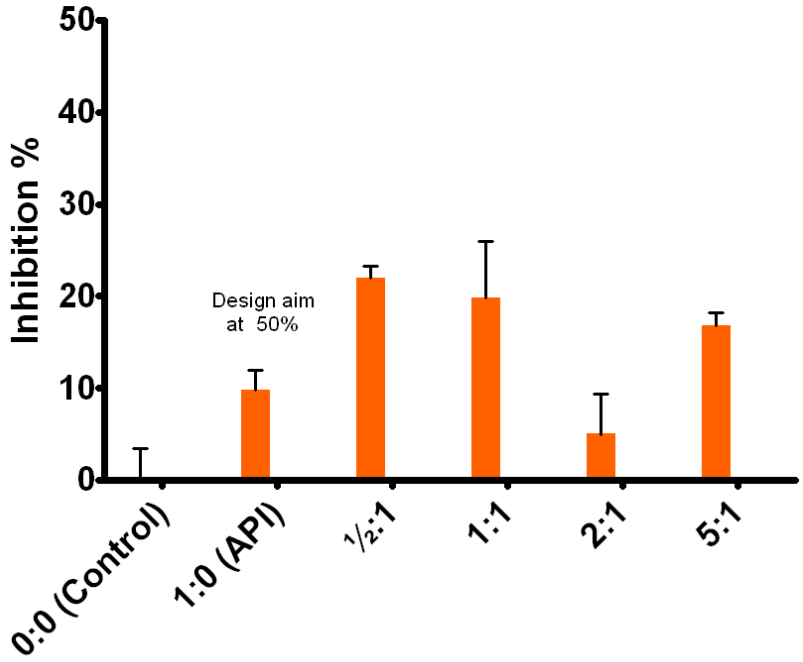
Treatment of water spiked with 114 pharmaceuticals with ozone did not change the toxicity to *Daphnia*, but a dose dependant trend for reduced toxicity was seen in the alga toxicity.

Ib. ClO2 treatment of pharmaceuticals

***Daphnia magna* immobialisation, ClO_2**



***P. Subcapita* growth inhibition, ClO_2**



ClO_2 did not as change the toxicity to alga, but a trend for increased *Daphnia* toxicity is seen after 48 h exposure.

2nd objective of study

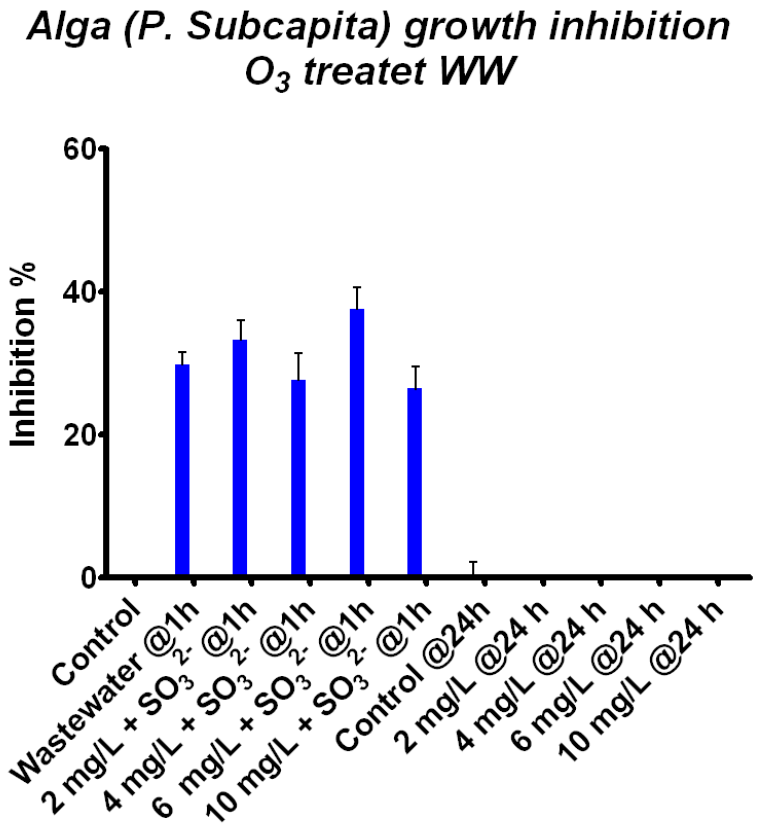
Does O_3 or ClO_2 treatment of wastewater create toxicity?

Treatment with oxidant concentration 2-10 mg/L.

I. **Start test by destroying residual with sulphite after 1h treatment.**

II. **Start test after 24 h with no residual destruction.**

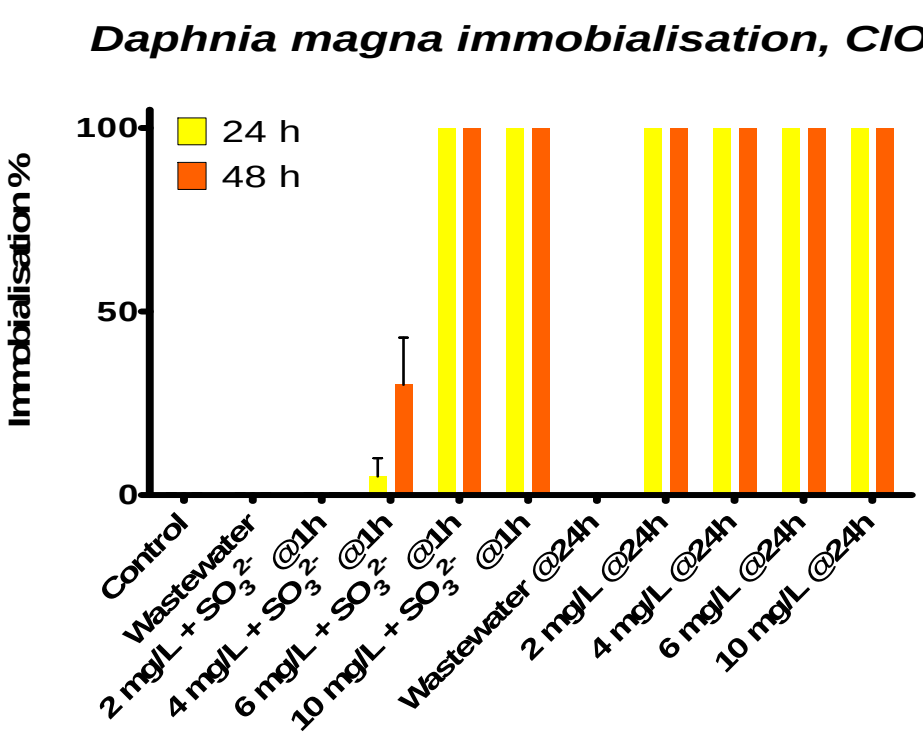
Ozonation of biologically treated wastewater

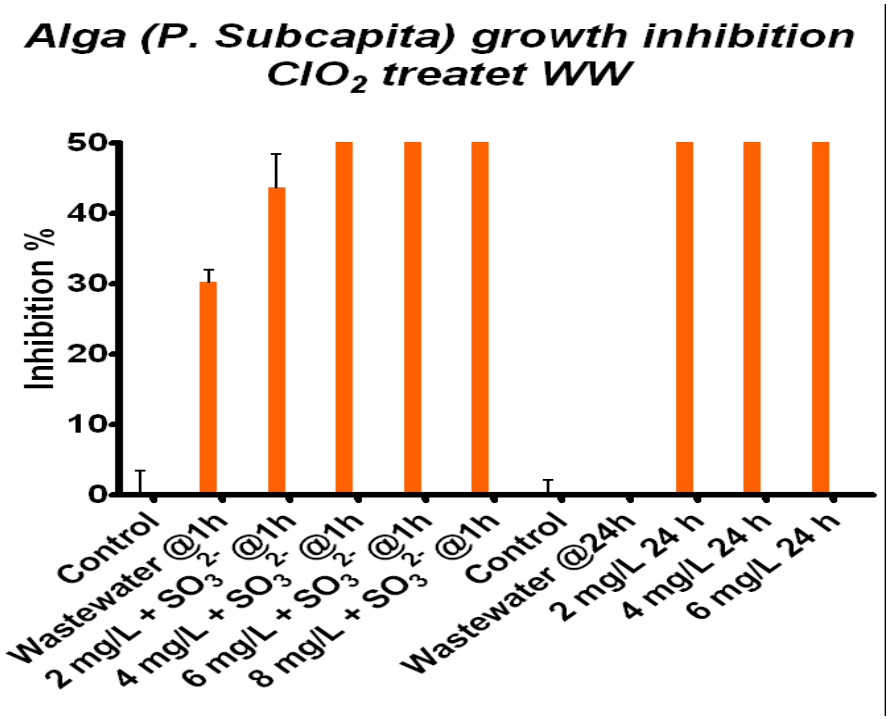


No effect on Daphnia !
The toxicity of WW to alga did not change in the 1h experiment with dose.

In the 24h treatment the alga control growth was lower than all test concentration, which makes the results unreliable.

ClO_2 treatment of biologically treated wastewater





ClO_2 did not change toxicity at 2 mg/L, but at 4 mg/L and higher significant toxicity was seen to both alga and *Daphnia*. Chlorite residuals (ClO_2^-) is suspected to be responsible. (Control growth in alga @24h is too low)

Reactions

I. $ClO_2 + NOM \rightarrow ClO_2^- + NOM\text{-}ox$

II. $ClO_2^- + NOM \rightarrow Cl^- + NOM\text{-}ox$

III. $ClO_2^- + SO_3^{2-} \rightarrow Cl^- + SO_4^{2-}$ (pH>7)

IV. $ClO_2^- + Fe^{2+} \rightarrow Cl^- + Fe(III)$

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Thank you for your attention!!!!!

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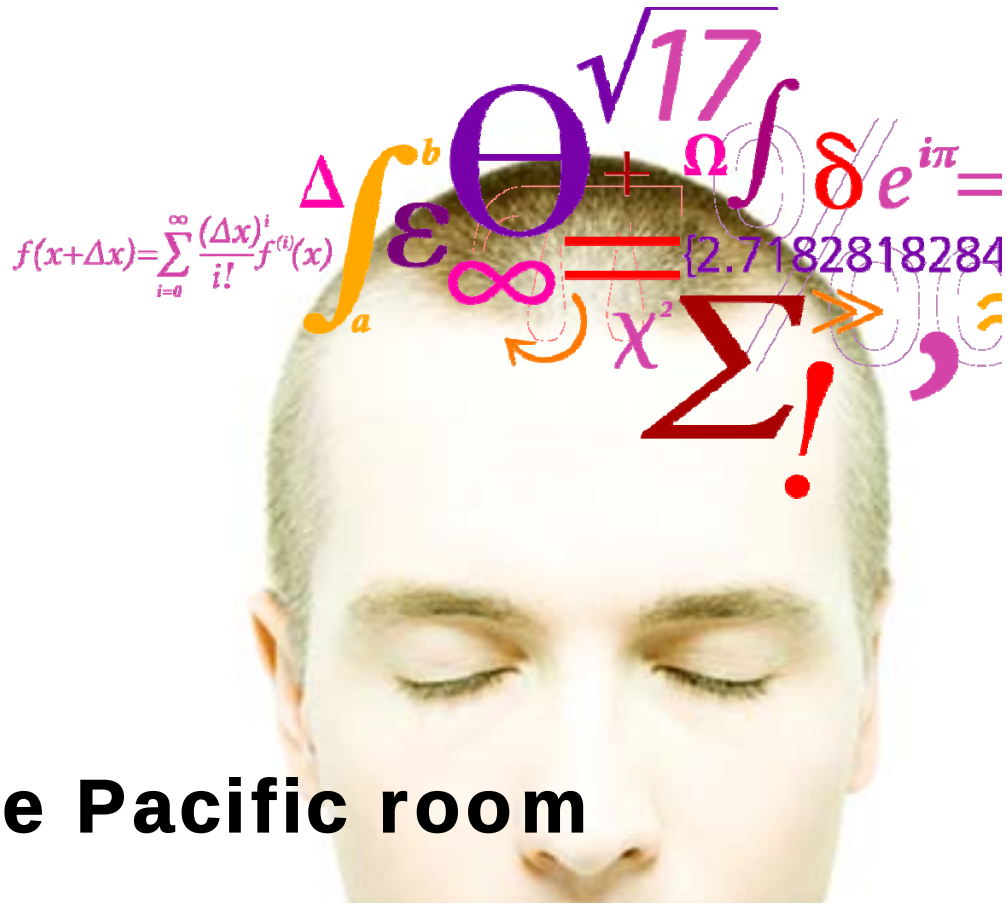

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